DG-1145: Combined License Applications for Nuclear Power Plants (LWR Edition)

Office of Nuclear Reactor Regulation
June 13, 2006

Section C.I.14, Verification Programs

- C.I.14.1 - summary of info required for Initial Test Program (no SRP 14.1)
- C.I.14.2 - detailed information requirements for Initial Test Program
- C.I.14.2 - ensure consistency w/ Regulatory Guide 1.68 and update to SRP 14.2
- C.I.14.3 - ITAAC

Section C.I.14.2, Initial Test Program

- Summary of Test Program & Objectives
- Organization and Staffing
- Test Procedures
- Conduct of Test Program
- Review, Evaluation, and Approval of Test Results
- Test Records
- Conformance of Test Programs with Reg Guides
- Utilization of Reactor Operating and Testing Experiences
- Trial Use of Plant Operating and Emergency Procedures
- Initial Fuel Loading and Criticality
- Test Program Schedule
- Individual Test Descriptions

Section C.I.14

- ITP "To Do" List for a COL w/DC

  - provide an Initial Test Program that is consistent with the guidance of RG 1.68

  - include test descriptions provided in certified designs

  - provide test descriptions for site-specific systems and components

Section C.I.14

- Section 14.3 – ITAAC
- Required by *proposed* regulations 52.80(b) as additional technical information required in the application
- Refers to C.II.2 for detailed guidance on complete set of ITAAC for the entire facility (COL-ITAAC)
- Refers also to C.I.13.3 for EP-ITAAC and C.I.13.6 for Security ITAAC
- Refers to C.III.7 for guidance on ITAAC for COL applicants that reference a certified design and/or early site permit

Section C.I.14-Public Comments and Questions

- 16 Questions received prior to public workshop
- Proposed responses

Section C.III.7, ITAAC for COL Applications Referencing a DC and/or ESP

The COL Applicant must propose a complete set of ITAAC for that addresses the entire facility, including emergency planning ITAAC and physical security ITAAC

COL ITAAC = (DC +EP + PS + SS) ITAAC

Section C.III.7

- Section C.III.7 – ITAAC "To Do" List
- Discusses the following ITAAC:
  - Design Certification ITAAC (DC-ITAAC)
  - Site Specific ITAAC (SS-ITAAC)
  - Emergency Planning ITAAC (EP-ITAAC)
  - Physical Security hardware ITAAC (PS-ITAAC) (proposed generic ITAAC under development by NEI)
- Discusses terminology associated with ITAAC that are unique to certified designs (e.g., Tier 1, Tier 2, Tier 2*, basic configuration, functional arrangement, etc.)

Section C.III.7 – "ITAAC Active Life"

- ITAAC for the entire facility will be subject to a License Condition and once completed no longer constitute regulatory requirements
- ITAAC that originate from a Certified Design will remain as part of the certified design rule after successful completion by a licensee

Section C.III.7- Public Questions and Comments

- 5 public comments/questions received prior to public workshop
- Proposed responses

DG 1145 – Sections C.I.3.1-C.I.3.3
Design of Structures, Systems, Components, and Equipment

13 June 2006

R. Brad Harvey
New Reactor Infrastructure Guidance Development Branch

Overview

- Section Outline
- Section References
- Content Highlights
- Referencing a Certified Design

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Section Outline

- **C.I.3.1 Conformance with NRC General Design Criteria**
- **C.I.3.2 Classification of Structures, Systems, and Components**
  - C.I.3.2.1 Seismic Classification
  - C.I.3.2.2 System Quality Group Classification
- **C.I.3.3 Wind and Tornado Loadings**
  - C.I.3.3.1 Wind Loadings
  - C.I.3.3.2 Tornado Loadings

Section References

- **Regulations**
  - 10 CFR Part 50: §50.55a, Appendix B
  - 10 CFR Part 100: Appendix A
- **Regulatory Guide 1.70**
- **Other Applicable Regulatory Guides**
  - e.g., 1.26, 1.29, 1.143, 1.151
- **Standard Review Plan (NUREG-0800)**
- **ASCE/SEI 7-05**

Content Highlights

- **Proposed Rev.1 to RG 1.76 (DG-1143)**
  - Lowers max design-basis tornado wind speeds to 300 mph

Referencing a Certified Design

If a COL application references a certified design, which areas remain to be reviewed by the NRC staff?

Referencing a Certified Design

- **C.III.1.3.1 Conformance with NRC General Design Criteria**
  - Discuss the extent to which SSCs important to safety will be designed, fabricated, erected, and tested in accordance with GDC 1 (Quality Standards & Records)
  - Discuss the extent that the SSCs important to safety that are outside the scope of the certified design meet the GDC as specified in Appendix A to 10 CFR Part 50
    - e.g., ultimate heat sink, intake structure, and associated pumps, valves, piping and instrumentation
    - need to address GDC 2, 5, 44, 45, and 46

Referencing a Certified Design

- **C.III.1.3.2 Classification of Structures, Systems, and Components**
  - Provide the seismic and quality group classification of important to safety SSCs outside the scope of the certified design
    - e.g., ultimate heat sink, intake structure, service water pumps, service water valves, service water filtration devices.

Referencing a Certified Design

- **C.III.1.3.3 Wind and Tornado Loadings**
  - Show that the site's design-basis wind and tornado characteristics are bounded by the equivalent DC wind and tornado site parameters or demonstrate by some other means that the proposed facility is acceptable at the proposed site
  - Show that the failure of any non-DC facility structure or component not designed for tornado loads will not affect the ability of other DC facility structures to perform their intended safety functions.

Referencing a Certified Design

- Changes from the referenced DC to address discrepancies between the DC site parameters and the actual site characteristics
  - must be in accordance with Section VIII, "Processes for Changes and Departures," of the respective DC rule appended to 10 CFR Part 52
  - additional guidance is provided in DG-1145 Section VI.3, "General Description of Change Processes"

Questions?

DG 1145 – Sections C.I.3.4-C.I.3.6
Design of Structures, Systems, Components, and Equipment

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Overview

- Section Outline
- Section References
- Content Highlights
- Response to Early Public Feedback
- Referencing a Certified Design

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Section Outline

- **C.I.3.4 Water Level (Flood) Design**
  - C.I.3.4.1 Flood Protection
  - C.I.3.4.2 Analysis Procedures
- **C.I.3.5 Missile Protection**
  - C.I.3.5.1 Missile Selection and Description
    - C.I.3.5.1.1 *Internally Generated Missiles (Outside Containment)*
    - C.I.3.5.1.2 *Internally Generated Missiles (Inside Containment)*
    - C.I.3.5.1.3 *Turbine Missiles*
    - C.I.3.5.1.4 *Missiles Generated by Tornadoes and Extreme Winds*
    - C.I.3.5.1.5 *Site Proximity Missiles (Except Aircraft)*
    - C.I.3.5.1.6 *Aircraft Hazards*
  - C.I.3.5.2 Structures, Systems, and Components To Be Protected from Externally Generated Missiles
  - C.I.3.5.3 Barrier Design Procedures

Section Outline (cont'd)

- **C.I.3.6 Protection Against Dynamic Effects Associated with Postulated Rupture of Piping**
  - C.I.3.6.1 Plant Design for Protection Against Postulated Piping Failures in Fluid Systems Outside of Containment
  - C.I.3.6.2 Determination of Rupture Locations and Dynamic Effects Associated with the Postulated Rupture of Piping
    - *C.I.3.6.2.1 Criteria Used to Define Break and Crack Location and Configuration*
    - *C.I.3.6.2.2 Guard Pipe Assembly Design Criteria*
    - *C.I.3.6.2.3 Analytical Methods to Define Forcing Functions and Response Models*
    - *C.I.3.6.2.4 Dynamic Analysis Methods to Verify Integrity and Operability*
    - *C.I.3.6.2.5 Implementation of Criteria Dealing with Special Features*
  - C.I.3.6.3 Leak-Before-Break Evaluation Procedures

Section References

- **Regulations**
  - 10 CFR Part 50: Appendix B
  - 10 CFR Part 100: Subpart B, Appendix A
- **Regulatory Guide 1.70**
- **Other Applicable Regulatory Guides**
  - e.g., 1.13, 1.27, 1.59, 1.76, 1.102, 1.115, 1.117, 1.125
- **Standard Review Plan (NUREG-0800)**
- **ASME Boiler and Pressure Vessel Code**

Content Highlights

- **Proposed Rev.1 to RG 1.76 (DG-1143)**
  - Lowers max design-basis tornado wind speeds to 300 mph
  - Includes revised tornado missiles (moved from SRP 3.5.1.4)

Early Public Feedback

- **C.I.3.6.2.1 Criteria Used to Define Break and Crack Location and Configuration**
  - Comment: Remove the requirement to provide:
    - Resulting number and location of design basis breaks and cracks
    - Postulated rupture orientations for each postulated design basis break location
  - Detailed analysis will not be completed until post COL submittal
  - Response: Staff requires requested information to have reasonable assurance that the proposed facility will meet regulatory requirements.

Early Public Feedback

- **C.I.3.6.3(1)(a) Leak-Before-Break Evaluation Procedures**
  - Comment: Remove the requirement to identify the types of materials and material specifications (including heat numbers) used for the base metal, weldments, nozzles, and safe ends.
  - Information will not be available for near-term COLs
  - Response: Heat numbers not required, but Staff needs to know material specifications to have reasonable assurance that the proposed facility will meet regulatory requirements.

Early Public Feedback

- **C.I.3.6.3(1)(b) Leak-Before-Break Evaluation Procedures**
  - Comment: Remove requirement to provide material properties for LLB piping. Material properties of as-built materials will not be available until the construction phase.
  - Detailed nozzle properties should not be required.
  - Response: Staff needs to know range of material properties to have reasonable assurance that the proposed facility will meet regulatory requirements.

Early Public Feedback

- **C.I.3.6.3(2)(a) Leak-Before-Break Evaluation Procedures**
  - Comment: Delete "as-built" from the requirement that as-built drawings of pipe geometry be provided.
  - As-built drawings would not be available until the construction phase (post COL submittal) and design isometrics can be provided.
  - Response: Staff expects this will be an ITAAC added to the COL.

Referencing a Certified Design

If a COL application references a certified design, which areas remain to be reviewed by the NRC staff?

Referencing a Certified Design

- **C.III.1.3.4 Water Level (Flood) Design**
  - Show that the site's hydrological flood characteristics are bounded by the equivalent DC hydrological flood site parameters
  - Verify that failure of fluid storage structures outside the scope of the certified design will not cause localized flooding conditions more severe than the design basis external flood
  - Describe any dewatering systems outside the scope of the certified design necessary to bring site groundwater parameters within those assumed for the certified design.

Referencing a Certified Design

- **C.III.1.3.5 Missile Protection**
  - C.III.1.3.5.1.3 *Turbine Missiles*
    - Submit a plant-specific turbine system maintenance program
    - Submit plant-specific probability calculations of turbine missile generation

Referencing a Certified Design

- **C.III.1.3.5 Missile Protection (cont'd)**
  - C.III.1.3.5.1.4 *Missiles Generated by Tornadoes and Extreme Winds*
    - Identify all missiles generated as a result of high-speed winds
    - Show that all the missiles generated as a result of the site's high-speed winds are bounded by the equivalent DC missile parameters or demonstrate by some other means that the proposed facility is acceptable at the proposed site
      - e.g., demonstrate that the certified design provides adequate protection against the automobile tornado missile that might have an origin more that 30 feet above plant grade

Referencing a Certified Design

- **C.III.1.3.5 Missile Protection (cont'd)**
  - C.III.1.3.5.1.5 *Site Proximity Missiles (Except Aircraft)*
    - Identify all missile sources such as those resulting from accidental explosions in the vicinity of the site
    - Estimate the total probability of the missiles striking a vulnerable critical area of the plant
    - If the total probability is greater than approximately 10^{-7} per year, show that the site proximity missiles are bounded by the equivalent DC missile site parameters or demonstrate by some other means that the proposed facility is acceptable at the proposed site

Referencing a Certified Design

- **C.III.1.3.5 Missile Protection (cont'd)**
  - C.III.1.3.5.1.6 *Aircraft Hazards*
    - Perform an aircraft hazard analysis in the vicinity of the site
    - Estimate the total probability of an aircraft striking a vulnerable critical area of the plant
    - If the total probability is greater than approximately 10^{-7} per year, show that the aircraft impact is bounded by the equivalent DC missile site parameters or demonstrate by some other means that the proposed facility is acceptable at the proposed site

Referencing a Certified Design

- **C.III.1.3.5 Missile Protection (cont'd)**
  - C.III.1.3.5.3 Barrier Design Procedures
    - For each SSC that needs to be reanalyzed for a tornado, extreme wind, or site proximity missile impact or for aircraft impact, demonstrate the ability of each structure or barrier to resist missile hazards

Referencing a Certified Design

- **C.III.1.3.6 Protection Against Dynamic Effects Associated with Postulated Rupture of Piping**
  - C.III.1.3.6.1 Plant Design for Protection Against Postulated Piping Failures in Fluid Systems Outside Containment
    - Discuss protection for safety-related SSCs against the dynamic effects of pipe failures (COL Action Item)

Referencing a Certified Design

- **C.III.1.3.6 Protection Against Dynamic Effects Associated with Postulated Rupture of Piping**
  - C.III.1.3.6.2 Determination of Rupture Locations and Dynamic Effects Associated with the Postulated Rupture of Piping
    - Provide results of final pipe break hazard analysis (COL Action Item)
      - Discuss the implementation of criteria for defining pipe break and crack locations and configurations
      - Discuss the implementation of design criteria relating to protective assemblies or guard pipes used for piping penetration of containment areas
      - Discuss the implementation of the method used for pipe whip dynamic analyses including jet thrust and pipe whip dynamic effects
      - Discuss the implementation of dynamic analyses methods used to verify the integrity and operability of the impacted SSCs
      - Discuss the implementation of criteria dealing with special features such as augmented inservice inspection program or the use of special protective devices such as pipe whip restraints